

WHAT IS CLAIMED IS:

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1. A detection apparatus (ST) for detecting a position of a mark (WAMX, WAMY) formed on an object (WF) placed on a stage, comprising:
 - 5 an image sensing system (MCX, MCY) averaging an image signal obtained by sensing an image of the mark (WAMX, WAMY) formed on the object (WF);
 - a measurement system obtaining average data (dx, dy) of a position deviation of the stage; and
 - 10 an arithmetic section calculating the position (MCX - dx, MCY - dy) of the mark at a state that the stage is at rest on the basis of image data average by said image sensing system and a measurement result (dx, dy) by said measurement system.
 - 15 2. The apparatus according to claim 1, wherein said image sensing system stores image signals associated with the image of the mark during a predetermined observation period and obtains an average position (MCX, MCY) of the mark during the observation period on the basis of
20 the stored image signals.
 3. The apparatus according to claim 1, wherein said image sensing system and said measurement system measure an average image signal of the mark and the average deviation (dx, dy) of the stage during substantially the same
25 observation period, respectively.
 4. The apparatus according to claim 1, wherein

after the stage moves to a position where said measurement system can measure the position of the mark and before the stage stops, said image sensing system and said measurement system start measurement to obtain an average
5 image signal of the mark and the average deviation of the stage, respectively.

5. The apparatus according to claim 1, wherein said image sensing system comprises an off-axis scope (OE).

10 6. The apparatus according to claim 1, wherein said measurement system comprises an interferometer (IFX, IFY, IF θ , MRX, MRY).

7. The apparatus according to claim 1, wherein the object has a plurality of areas, and a mark is
15 formed in correspondence with each area, and positions of the plurality of marks at a state that the stage is at rest are detected by said image sensing system, said measurement system, and said arithmetic section.

8. The apparatus according to claim 7, further comprising
20 a positioning control section for executing global alignment on the basis of detection results of the positions of the plurality of marks.

9. The apparatus according to claim 1, wherein
25 in an area where said image sensing system can measure the position of the mark, said image sensing system and said measurement system execute measurement to obtain an average

image signal of the mark and the average deviation of the stage, respectively, while moving the stage at a predetermined speed, and said arithmetic section calculates the position of the mark, while the stage is at rest, on the basis of the measurement results.

10. The apparatus according to claim 9, wherein the predetermined speed is a constant speed.

11. An exposure apparatus comprising:

10 a stage moving a substrate (WF) placed on a stage;
a projecting lens (LN) projecting a pattern onto the substrate (WF);

first measurement means for measuring a position (MCX, MCY) of a mark (WAMX, WAMY) formed on the substrate (WF) on the basis of an average image signal of the mark;

15 second measurement means for measuring an average deviation (dx, dy) of said stage;

calculation means for calculating the position (MCX - dx, MCY - dy) of the mark at a state that said stage is at rest on the basis of a measurement result (MCX, MCY) by said first measurement means and a measurement result (dx, dy) by said second measurement means; and

positioning means for driving said stage on the basis of a calculation result by said calculation means to position the substrate (WF) at a target position.

25 12. The apparatus according to claim 11, wherein said first measurement means comprises image sensing

means for sensing an image of the mark, said image sensing means storing image signals associated with the image of the mark during a predetermined observation period and obtaining an average position of the mark during the observation period
5 on the basis of the stored image signals.

13. The apparatus according to claim 11, wherein said first measurement means and said second measurement means measure an average position of the mark and the average deviation of said stage during substantially
10 the same observation period, respectively.

14. The apparatus according to claim 11, wherein after said stage moves to a position where said first measurement means can measure the position of the mark and before said stage stops, said first measurement means and
15 said second measurement means start measuring the position of the mark and the average deviation of said stage, respectively.

15. The apparatus according to claim 11, wherein said first measurement means comprises an off-axis
20 scope (OE).

16. The apparatus according to claim 13, wherein said second measurement means comprises an interferometer (IFX, IFY, IF θ , MRX, MRY).

17. The apparatus according to claim 11, wherein
25 the substrate has a plurality of areas to be exposed, and a mark is formed in correspondence with each area to be

exposed, and

positions of the plurality of marks while said stage is at rest are detected by said first measurement means, said second measurement means, and said calculation means.

- 5 18. The apparatus according to claim 17, further comprising

positioning means for executing global alignment on the basis of detection results of the positions of the plurality of marks.

- 10 19. The apparatus according to claim 11, wherein

in an area where said first measurement means can measure the position of the mark, said first measurement means and said second measurement means measure the position of the mark and the average deviation of said stage,

- 15 respectively, while moving said stage at a predetermined speed, and said calculation means calculates the position of the mark at a state that said stage is at rest on the basis of the measurement results.

- 20 20. The apparatus according to claim 19, wherein the predetermined speed is a constant speed.

21. The apparatus according to claim 11, further comprising

determination means for determining a calculation mode to be applied when said calculation means calculates the position of the mark while said stage is at rest.

- 25 22. The apparatus according to claim 21, wherein

said determination means determines the correction mode on the basis of the position of the mark and the deviation of said stage, which are measured by said first measurement means and said second measurement means while placing, on
5 said stage, an inspection substrate having a mark formed by exposing a pattern by said exposure apparatus.

23. A detection method of detecting a position of a mark (WAMX, WAMY) formed on an object (WF) placed on a stage, comprising:

10 the first measurement step of measuring a position (MCX, MCY) of a mark (WAMX, WAMY) formed on the object (WF) on the basis of an average image signal of the mark;

the second measurement step of measuring an average deviation (dx, dy) of the stage; and

15 the calculation step of calculating the position (MCX - dx, MCY - dy) of the mark at a state that the stage is at rest on the basis of a measurement result (MCX, MCY) in the first measurement step and a measurement result (dx, dy) in the second measurement step.

20 24. A method of controlling an exposure apparatus having a stage for moving a substrate (WF) placed on a stage, and a projecting lens (LN) for projecting a pattern onto the substrate (WF), comprising:

the first measurement step of measuring a position (MCX, MCY) of a mark (WAMX, WAMY) formed on the substrate (WF) on
25 the basis of an average image signal of the mark;

the second measurement step of measuring an average deviation (dx, dy) of the stage;

the calculation step of calculating the position (MCX - dx, MCY - dy) of the mark at a state that the stage is on
5 the basis of a measurement result (MCX, MCY) in the first measurement step and a measurement result (dx, dy) in the second measurement step; and

the positioning step of driving said stage on the basis of a calculation result in the calculation step to position
10 the substrate (WF) at a target position.

25. A method of manufacturing a device, comprising the steps of:

placing a substrate applied with a resist on a stage of said exposure apparatus of claim 11;

15 aligning the substrate in said exposure apparatus; and
transferring a pattern to the substrate in said exposure apparatus.

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